We claim:

1. A rotary piston machine, comprising

(a) a housing defining a prismatic chamber the cross section of which forms an oval of odd order, which is alternatingly composed of circular arcs having a first relatively small radius of curvature and circular arcs having a second, relatively large radius of curvature, said arcs changing into each other continuously and differentiably, whereby corresponding first and second cylindrical inner wall sections of said chamber are formed,

(b) a prismatic rotary piston on which diametrically opposite, cylindrical nappe sections having said first radius of curvature are formed, of which, in each position, a respective one is rotatable in a first one of said cylindrical inner wall sections and the respective other one engages an opposite one of said second inner wall sections, whereby said rotary piston, in each position, subdivides said chamber into two working chambers, the volumes of which, with progressive rotation of the rotary piston are alternatingly increased and reduced, said cylindrical nappe sections defining a center plane, in which piston-fixed instantaneous axes of rotation of the rotary piston extending along the cylinder axes of said cylindrical nappe sections are defined,

(c) means for cyclically passing working medium into the working chambers and letting it escape therefrom, said rotary piston, in each interval of movement rotating with a first one of said diametrically opposite nappe sections in a first inner wall section about a first associated instantaneous axis of rotation, which extends along the cylinder axis of said first inner wall section, and sliding with the second one of said diametrically opposite nappe sections along the opposite second inner wall section of the chamber into the next following first inner wall section of the chamber and reaching a stop position

there; and the instantaneous axis of rotation subsequently jumping, for the next interval of movement, into a changed position defined by said consecutive inner wall section and corresponding to the other piston-fixed axis of rotation, and

(d) means for coupling a driving or driven shaft with said the rotary piston,

and further comprising

(e) fixing means for temporarily fixing said instantaneous axis of rotation for the subsequent interval of movement, when said changed position has been reached.

2. A rotary piston machine as claimed in claim 1, **wherein** said fixing means release said rotary piston prior to reaching the next one of said stop positions.

3. A rotary piston machine as claimed in claim 2, **wherein**

(a) said fixing means comprise coupling structures on one end face of said rotary piston in the area of said possible piston-fixed instantaneous axes of rotation, and

(b) housing-side axially movable shafts having complementary coupling structures on the axes of said first cylindrical inner wall sections, said coupling structures being moved into engagement with said coupling structures of the rotary piston to fix the respective instantaneous axis of rotation.

4. A rotary piston machine as claimed in claim 3, **wherein**

(a) the piston-side coupling structures are conical recesses in the end faces of said rotary piston and

(b) said shaft-side coupling structures are conical heads, means being provided for inserting said conical heads into the conical recesses to establish the coupling.

5. A rotary piston machine as claimed in claim 4, **wherein** said inserting means are electrical actuators.

6. A rotary piston machine as claimed in claim 1, **wherein**

(a) a driving or driven shaft with a pinion thereon extends centrally through said chamber, and

(b) said rotary piston has an aperture therethrough which is elongated in cross section, the longer axis of said aperture being normal to a center plane of the rotary piston, and

(c) said aperture has an internal toothing which meshes with said pinion.

7. A rotary piston machine as claimed in claim 5, **wherein** sensor means are provided for controlling said electrical actuators, said sensor means responding to rotary motion of said driving or driven shaft.

8. A rotary piston machine as claimed in claim 6, **wherein**

(a) said internal toothing has opposite concave gear racks on both sides of the longer axis of said aperture, and

(b) the internal toothing, furthermore, comprises non-concave end toothings at the ends of said aperture.

9. A rotary piston machine as claimed in claim 8, **wherein** said end toothings are linear gear racks.

10. A rotary piston machine as claimed in claim 8, **wherein** the end toothings are convex gear racks.

11. A rotary piston machine as claimed in claim 1, **wherein** the cross section of said rotary piston is also an oval, which alternatingly is composed of circular arcs which change into each other continuously and differentiably, whereby respective first and second cylindrical nappe sections are formed.

12. A rotary piston machine as claimed in claim 1, **wherein**

(a) longitudinal grooves are formed in said diametrically opposite cylindrical nappe sections of said rotary piston, the grooves accommodating seals for sealing between said working chambers, said seals engaging the inner surface of the chamber, and

(b) valve means for connecting said longitudinal grooves, with the working chamber of higher pressure, if a large pressure difference occurs, said valve means being controlled by the pressure difference between said working chambers.

13. A rotary piston machine as claimed in claim 12, **wherein**

(a) said valve means comprise a bore provided in said rotary piston and interconnecting said working chambers adjacent said rotary piston,

(b) sleeve-shaped closure pieces having longitudinal connecting bores separating said bore, at both ends, from said working chambers,

(c) a slide valve is guided in said bore and is provided with reduced diameter sections on both sides, whereby, in end positions of said slide valve, a respective reduced diameter section engages said connection bore of the adjacent one of said closure pieces.

14. A rotary piston machine as claimed in claim 12, **wherein** said seals have a convex profile matching with the radius of curvature of one of said cylindrical inner wall sections.

15. A rotary piston machine as claimed in claim 14, **wherein**

(a) pairs of parallel grooves and seals are provided in said two diametrically opposite cylindrical nappe sections,

(b) one seal of each pair has a convex profile with the first radius of curvature, and the other seal of each pair has a convex profile with the second radius of curvature.

16. A rotary piton machine as claimed in claim 14, **wherein** said seals are longitudinally subdivided into notional strips, the radius of curvature in at least one strip is equal to the smaller radius of curvature of said first inner wall sections and in at least one strip is equal to the larger radius of curvature of said second inner wall sections.

17. A rotary piston machine as claimed in claim 16. **wherein** each of the seals, in two outer strips has the smaller radius of curvature and, in the intermediate inner strip, has the larger radius of curvature.

18. A rotary piston machine as claimed in claim 1, **wherein**

(a) the cross section of the chamber of the rotary piston machine is an oval of odd order $(2n+1)>3$, and

(b) the cross section of the rotary piston is an oval of even order 2n, in particular a quatro-oval or a sext-oval,

(c) the rotary piston having two diametrically opposite main apexes with the two diametrically opposite cylindrical nappe surfaces, and the piston-side possible instantaneous axes of rotation are located on the center plane interconnecting the main apexes.

19. A rotary piston machine, comprising

(a) a housing defining a prismatic chamber the cross section of which forms an oval of odd order, which is alternatingly composed of circular arts having a first relatively small radius of curvature and circular arcs having a second, relatively large radius of curvature, which arcs change into each other continuously and differentiably, whereby corresponding first and second cylindrical inner wall sections are formed,

(b) a prismatic rotary piston, on which diametrically opposite, cylindrical nappe sections having the first radius of curvature are formed, of which, in each position, a respective one is rotatable in a first cylindrical inner wall section and the respective other one engages an opposite inner wall section, whereby the rotary piston, in each position, subdivides the chamber into two working chambers, the volumes of which, with progressive rotation of the rotary piston are alternatingly increased and reduced, the cylindrical nappe sections defining a center plane, in which piston-fixed instantaneous axes of rotation of the rotary piston extending along the cylinder axes of the cylindrical nappe sections are defined,

(c) means for cyclically passing working medium into the working chambers and letting it escape therefrom, the rotary piston, in each interval of movement rotating with a first one of the diametrically opposite nappe sections in a first inner wall section about a first associated instantaneous axis of rotation, which extends along the cylinder axis of the first inner wall section, and sliding with the second one of the diametrically opposite nappe sections along the opposite second inner wall section of the chamber into the consecutive first inner wall section of the chamber and reaching a stop position there; and the instantaneous axis of rotation subsequently jumping, for the next interval of movement, into a changed position defined by said consecutive inner wall section and corresponding to the other piston-fixed axis of rotation, and

(d) means for coupling a shaft with the rotary piston,

wherein

(e) the cross section of the chamber of the rotary piston machine is an oval of the odd order $(2n+1) > 3$, and

(f) the cross section of the rotary piston is an oval of the even order 2n, in particular a quatro-oval or a sext-oval,

(c) the rotary piston having two diametrically opposite main apexes with the two diametrically opposite cylindrical nappe surfaces, and the piston-side possible instantaneous axes of rotation are located on the center plane interconnecting the main apexes.

21 A rotary piston machine as claimed inclaim 1, **wherein** the combustion chamber has a cross section which has the shape of a figure of equal height, and the piston has a shape adapted to the shape of the combustion chamber, wherein the piston is mirror-symmetric to the center plane, the center plane intersecting two centers of curvature of the combustion chamber which have maximum distance from each other, and the nappe of the piston, in one stop position on one side of the center plane, completely abuts the inner wall of the smaller portion of the combustion chamber resulting therefrom.